Claims

1. A semiconductor acceleration sensor comprising:

a semiconductor sensor body including a weight fixing portion located at a central area thereof, a cylindrical support portion located at an outer peripheral area thereof, and a diaphragm portion having flexibility and located between said weight fixing portion and said support portion,

an acceleration sensor element composed of diffused resistors formed in said diaphragm portion, and

a weight fixed on said weight fixing portion in such a manner that a center of said weight is aligned with a centerline passing through a center of said weight fixing portion and extending in a direction orthogonal to an extending direction of said diaphragm portion,

said support portion having an inner peripheral surface constituted by four trapezoidal inclined surfaces of a substantially identical shape that are annularly combined so as to define an outer peripheral surface of a frust-pyramidal internal space of said support portion,

wherein said weight has an abutting portion including a linear portion which abuts against said inclined surfaces constituting said inner peripheral surface when said weight makes a maximum displacement in a direction where said diaphragm portion is located,

wherein said abutting portion has a circular outline shape as seen from a side where said weight fixing portion is located, and

wherein a stopper structure is constituted by said inner peripheral surface of said support portion and said abutting portion, for restricting a displacement range of said weight in a direction where said diaphragm portion is located.

2. The semiconductor acceleration sensor of claim 1 further comprising a cylindrical pedestal having an internal space, on which said support portion is mounted, wherein said weight is so shaped as to be disposed in two said internal spaces of said support portion and said pedestal.

3. The semiconductor acceleration sensor of claim 1, wherein a part of said weight disposed in said internal space of said support portion has a first surface extending in a direction along said diaphragm portion and a second surface extending in a direction orthogonal to said inner peripheral surface of said support portion, and an intersection of said first and second surfaces defines said abutting portion.

4. The semiconductor acceleration sensor of claim 1, wherein a contact position of said abutting portion and said inclined surfaces is located on a side of a bottom surface of said support portion relative to a central position of said support portion in a thickness direction thereof.

5. The semiconductor acceleration sensor of claim 1, wherein said weight is made of tungsten.

6. A semiconductor acceleration sensor comprising:

a semiconductor sensor body formed integrally with a semiconductor crystal substrate by means of anisotropic etching, and including a weight fixing portion located at a central area

thereof, a cylindrical support portion located at an outer peripheral area thereof, and a diaphragm portion having flexibility and located between said weight fixing portion and said support portion,

an acceleration sensor element composed of diffused resistors formed in said diaphragm portion, and

a weight fixed on said weight fixing portion in such a manner that a center of said weight is aligned with a centerline passing through a center of said weight fixing portion and extending in a direction orthogonal to an extending direction of said diaphragm portion,

said weight fixing portion protruding into an internal space of said cylindrical support portion,

said internal space, in which said weight fixing portion is contained, being shaped in a frust-pyramid of which a cross-sectional shape is becoming smaller toward said diaphragm portion,

an inner peripheral surface of said support portion being constituted by four trapezoidal inclined surfaces which define an outer peripheral surface of said internal space, and

said weight being so shaped that at least part of said weight is disposed in said internal space,

wherein said part of said weight disposed in said internal space has an abutting portion including a liner portion which abuts against said four inclined surfaces constituting said inner peripheral surface when said weight makes a maximum displacement in a direction where said diaphragm portion is

located,

wherein said abutting portion has a circular outline shape as seen from a side where said weight fixing portion is located, and

wherein a stopper structure is constituted by said inner peripheral surface of said support portion and said abutting portion, for restricting a displacement range of said weight in a direction where said diaphragm portion is located.

7. The semiconductor acceleration sensor of claim 6 further comprising a cylindrical pedestal having an internal space, on which said support portion is mounted, wherein said weight is so shaped as to be disposed in two said internal spaces of said support portion and said pedestal.

8. The semiconductor acceleration sensor of claim 6, wherein a part of said weight disposed in said internal space of said support portion has a first surface extending in a direction along said diaphragm portion and a second surface extending in a direction orthogonal to said inner peripheral surface of said support portion, and an intersection of said first and second surfaces defines said abutting portion.

9. The semiconductor acceleration sensor of claim 6, wherein a contact position of said abutting portion and said inclined surfaces is located on a side of a bottom surface of said support portion relative to a central position of said support portion in a thickness direction thereof.

10. The semiconductor acceleration sensor of claim 6, wherein said weight is made of tungsten.

11. A manufacturing method of a semiconductor acceleration sensor, which comprises a semiconductor sensor body including a weight fixing portion located at a central area thereof, a cylindrical support portion located at an outer peripheral area thereof and having an inner peripheral surface constituted by four trapezoidal inclined surfaces of a substantially identical shape which are annularly combined so as to define an outer peripheral surface of a frust-pyramidal internal space of said support portion, and a diaphragm portion having flexibility and located between said weight fixing portion and said support portion; an acceleration sensor element composed of diffused resistors formed in said diaphragm portion; and a weight fixed on said weight fixing portion in such a manner that a center of said weight is aligned with a centerline passing through a center of said weight fixing portion and extending in a direction orthogonal to an extending direction of said diaphragm portion, comprising the steps of:

employing as said weight a weight having a part disposed in said internal space, which has an abutting portion including a linear portion which abuts against said four inclined surfaces constituting said inner peripheral surface when said weight makes a maximum displacement in a direction where said diaphragm portion is located, and has a circular outline shape as seen from a side where said weight fixing portion is located, and

joining said weight fixing portion and said weight in a state that said weight is placed close to said semiconductor sensor body until said abutting portion comes in contact with

said four inclined surfaces.

12. The manufacturing method of a semiconductor acceleration sensor of claim 11, wherein said weight fixing portion and said weight are joined by using an anaerobic adhesive.